

## CHAPTER 5

### SPECIAL STORAGE AREAS

#### 5-1. Flammable and combustible materials.

a. Purpose and sources. The storage of flammable and combustible materials constitutes a storage condition that needs a higher degree of safety consideration than conventional storage. Specifications governing construction practices for combustibles not outlined in this publication can be obtained from NFPA 30. One source for much of the information relating to material covered here can be found in the NFPA Fire Protection Handbook.

b. Segregation. Flammable and combustible materials must be kept segregated from other storage items to prevent large-scale fire damage to conventional storage items should the combustible material catch fire or ignite spontaneously. Design consideration should be given to maintaining this segregation throughout the entire storage operation.

(1) Shipping and receiving. Where facilities permit, special shipping and receiving areas and temporary storage areas should be maintained to prevent the volatile materials from coming in contact with other material.

(2) Location requirements. The building will be detached from any other building and located away from any other building by at least 50 feet. When design considerations allow, the building should be located as far away from occupied buildings as possible and situated with respect to the prevailing wind direction such that toxic fumes or smoke do not drift over occupied areas.

#### c. Firefighting equipment.

(1) Automatic sprinklers. Utility connections will be required where automatic sprinkler systems are to be installed within combustible and flammable storage warehouses. Sprinkler systems should provide a discharge density of greater than 0.5 gpm/square foot of floor area. A dry well or holding tank may be required. Water from sprinkler systems or spilled liquids must not be allowed to enter the ground water.

(2) Extinguishers. Outside, at least one portable fire extinguisher of rating not less than 12-B units as defined by NFPA 10 should be located within 10 feet of the door.

(3) Alarm systems. Combustible and flammable storage areas should be equipped with automatic alarm systems. Since these storage buildings are generally unoccupied, the alarm system must be automatic. The alarm system should be connected to an audible alarm device located

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on the outside of the building, if the building is located near occupied buildings, for purposes of early warnings. It should also be part of a system that automatically notifies the depot fire station or security office.

d. Open storage of flammable and combustible materials.

(1) Container types. Open storage of flammable and combustible materials can range from automotive fuel tank farms to drum storage of fuel oils and combustible chemicals. This discussion will be confined to design criteria for drum storage in open areas and small facilities for tank storage.

(2) Drum storage in open areas. Open storage areas for flammable and combustible materials will be away from occupied buildings and kept segregated from open storage areas for conventional material. The area to be used will be concrete surfaced with a 6-inch high berm running entirely around the storage area. Access to the interior of this special area will be provided for firefighting equipment by means of a concrete ramp that bridges the 6-inch-high curb. The slope of the ramp will be less than 10 percent. This ramp will also provide the needed access for forklift trucks and MHE. Pumps or other provisions should be made for removal of rainwater from the bermed area.

(3) Bulk storage. Bulk storage of flammable or combustible materials should be in tanks. These tanks should be constructed to conform to requirements in NFPA 30. They should be kept away from public ways and buildings, as shown in table 5-1. All storage sites will be sloped away from the tanks and the areas will be cleared of brush.

5-2. Radioactive hazards.

a. General. The storage of radioactive material involves serious health-related hazards that are not readily apparent. Radioactive material gives off radioisotopes which emit several types of radiation that are damaging to human tissue. The hazard is complicated by the fact that the radiation is not detectable by any of the human senses. As a result, artificial warning and safeguards should be provided to prevent contamination by these materials.

(1) Fire hazard. The problems of providing safe storage of radioactive material are complicated by the possibility of fire hazard. Materials that emit radiation can become vaporized or turned to ash during a fire. These particles then become airborne radiation and can easily spread to other areas and contaminate all that they touch. Firefighting efforts are also hampered when radioactive material is concerned. Due to the possibility of leaking radiation, firefighters

Table 5-1. Safety Distances for Tank Storage

Capacity Tank Gallons	Minimum Distance In Feet from Property Line Which Is or Can Be Built Upon, Including the Opposite Side of a Public Way	Minimum Distance In Feet From Nearest Side of any Public Way or From Nearest Important Building on the Same Property
275 or Less	5	5
276 to 750	10	5
751 to 12,000	15	5
12,001 to 30,000	20	5
30,001 to 50,000	30	10
50,001 to 100,000	50	15
100,001 to 500,000	80	25
500,001 to 1,000,000	100	35
1,000,001 to 2,000,000	135	45
2,000,001 to 3,000,000	165	55
3,000,001 or more	175	60

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cannot get close enough for a period of time long enough to fight the fire.

(2) Radiation levels. The level of measurable radiation is usually the indicator used to classify the type of radiation area. As defined by the Occupational Safety and Health Administration, a radiation area is any area accessible to personnel where the level of radiation over the major portion of the body is such that in a 1-hour period the radiation dose would be in excess of 5 millirems, or in any 5 consecutive days a dose in excess of 100 millirems would be recorded. A high radiation area is classified as any area where the level of radiation over the major portion of the body is greater than 100 millirems per hour. Greater detail on levels of radiation and their classifications can be found in OSHA 1910.96.

b. Location and containment requirements.

(1) Facilities within other buildings. For purposes of safety in case of a fire, it is recommended that a separate building be constructed for the housing of all stored radioactive material. If the depot's radioactive storage mission is small and construction of an entire building is not justified, a portion of an existing building can be modified to provide the containment requirements necessary for safe storage.

(2) Separate buildings. The location of separate facilities should be chosen so that the building is sufficiently distant from occupied buildings to preclude any danger of exposure to personnel not connected with movement or transportation of the material and to prevent contamination in case of an explosive accident. There should be sufficient access to the building such that fire equipment can get to the building in case of a fire or explosion, and the location should be chosen to minimize the possibility of human contact with airborne radiation that would result from any fire or explosion.

c. Site requirements. Selection of a radiation facility site will include consideration of the following factors.

(1) Surrounding operations considerations. The impact of surrounding operations upon the proposed facility will be included with respect to:

- Radiation background
- Effluents from nearby operations
- Fire and explosive hazard
- Capability of controlling access

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(2) Relative location of facility. Impact of proposed facility is to consider operations in surrounding areas and in areas downwind and downstream of the proposed site, i.e., increased radiation background, effect of effluent discharge, and impact of most severe plausible radiation incident.

(3) Possibility of flood or land movement. Buildings in which radioactive materials are to be stored should preferably be single story without basements or other below-grade spaces.

5-3. Chemicals. There are two areas of safety consideration associated with hazardous chemical storage, chemical leakage, and fire or combustion.

a. Special construction. The drainage system should be provided with a central dry well or holding tank. Drains are not to be tied into the general waste water return lines.

b. Open chemical storage. Certain chemicals are such that they can be stored in open storage areas. The construction requirements of such open storage areas are similar to the requirements described for open storage of flammable and combustible materials. Chemicals stored in drums should be given layouts such that all drums are easily inspected for leakage and that ready access to these drums can be made. Storage of sealed drums lying on their sides is preferable to stacking drums on end. When drums are laid on their sides, they will shed water rapidly due to the geometry of the drums, and there will be no areas for water to collect and cause corrosion. Inspection of drums is also made easier when they are laid on their sides since the tops are always visible.

c. Gas cylinder storage. Gas cylinders should be treated as if they were always full and storage conditions designed to reflect this rule. It is preferable that gas cylinders be stored in open-sided sheds in order to minimize the possibility of harm due to build-up of a combustible, flammable, or toxic gas if a cylinder leaks. If a storage shed or building is necessary to confine the gas, at least 50 feet clear space should be allowed between it and any surrounding building to prevent injury in the case of an explosion.

5-4. Signs and safety markings. All hazardous materials storage areas should be identified as dangerous areas and warnings about smoking or carrying other flaming materials should be posted.